Deformation Mechanisms,

Rheology and

Tectonics

Programme and Abstracts

19th International Conference on Deformation Mechanisms, Rheology and Tectonics

16-18 September 2013, Leuven, Belgium

Tuesday September 17th

SESSION 5: FLUIDS IN A DEFORMING ENVIRONMENT (2/3)

Chair: Anne-Marie Boullier

08:30 – 09:00 *keynote*
Urai J.L., Holland M., Kraus W., Telle R., Arndt M., Virgo S.
How good is the glue? An integrated investigation of the mechanical properties of rocks undergoing crack-seal processes, using field, experimental and numerical methods

09:00 – 09:20
Mamtani M.A., Mondal T.K.
AMS, vein orientation, and 3D Mohr circle analyses from Gadag (southern India) – recognizing fluid pressure fluctuation and its significance in Gold mineralization

09:20 – 09:40
Torremans K., Muchez P., Sintubin M.
Vein microstructures and vein property distributions at the Nkana Cu-Co deposit, Zambia

09:40 – 10:00
Schmatz J., Urai J.L., Sadler M.
Carbonic Inclusions in Natural Rock Salt and their Role in Development of Microstructure

10:00 – 10:30 Break

SESSION 6: METHODS IN STRUCTURAL GEOLOGY (1/2)

Chair: Janos Urai

10:30 – 10:50
Walter J.M., Randau C., Stipp M., Leiss B., Ullemeyer K., Klein H., Hansen B.T., Kuhs W.F.
New Perspectives for In-Situ Rock Deformation and Recrystallisation Analysis – POWTEX Neutron Diffractometer at FRM II Garching, Germany

10:50 – 11:10
Huet B., Yamato P., Grasemann B.
Influence of metamorphic reactions on rock strength: A new analytical model

11:10 – 11:30
Lokajíček T.
Laboratory approach to the study of elastic anisotropy on spheres by simultaneous longitudinal and transversal sounding under confining pressure

11:30 – 11:50
Svitek T., Lokajiček T., Petružálek M.
Determination of elastic anisotropy from P- and S-waves based on ultrasonic sounding on spherical samples

11:50 – 12:50 GENERAL ASSEMBLY

Vein microstructures and property distributions at the Nkana-Mindola Cu-Co deposit, Zambia

Koen Torremans, Philippe Muchez & Manuel Sintubin
Geodynamics and Geofluids Research Group, Department of Earth and Environmental Sciences, KU Leuven, Celestijnenlaan 200E, B-3001 Leuven, Belgium
koen.torremans@ees.kuleuven.be

The Nkana-Mindola deposit is a sediment-hosted Cu-Co ore body in the Zambian part of the Central African Copperbelt. A structural analysis of the Nkana South open-pit mine and several underground crosscuts reveals a succession of NW-SE trending doubly plunging folds with isoclinal interlimb angles, in accordance with the regional structural style, reflecting the late Neoproterozoic to early Cambrian Lufilian (Pan-African) orogeny. The fold train shows slight NE verging asymmetry and secondary parasitic folds decorate higher-order overturned folds.

Several vein generations are identified in the Neoproterozoic Katanga Supergroup metasediments at Nkana-Mindola. This study focuses on dolomitic fibrous bedding-parallel veins that comprise the first vein generation at Nkana. They are quite abundant within the black shales and metasiltstones. A strong diagenetic bedding-parallel foliation creates a mechanical anisotropy parallel to bedding. Microstructural study reveals a continuum between an antitaxial vein fill, symmetric with well-defined median zones, on the one hand, and an unitaxial vein fill, with asymmetric growth morphologies, on the other hand. A limited amount of growth competition is apparent in the dolomite fibres. These fibres are perpendicular to low-tortuosity vein walls, which are parallel to the bedding-parallel foliation. Abundant pseudosecondary fluid inclusion planes are perpendicular to the fibre long axis and indicate multiple growth events, albeit no solid crack-seal inclusion bands were identified. Adjacent fibres share smooth grain boundaries with each other and reveal accumulations of dust rims along the edges. During subsequent deformation, these veins acted as competent objects in a weak matrix, showing buckling, folding and pinch-and-swell structures.

To study the distribution and formation mechanisms of these veins, thirteen line transects perpendicular to the attitude of relatively undeformed veins were measured in underground crosscuts and boreholes, representing a total of 730 bedding-parallel veins. Cumulative vein thickness and spacing frequency plots reveal negative exponential distribution for all line transects.

These vein thickness and spacing distributions, combined with microstructural observations, serve as input for ongoing efforts in numerical modelling of bedding-parallel veins in multilayer sequences. The discrete element modelling (DEM) code ESyS-Particle is utilised to study the formation of subsequent generations of layer-parallel veins as a function of (1) changing stress states relative to a mechanical anisotropy in a specimen and (2) variation in mechanical strength of rock and vein material. Calibrated brittle-elastic numerical layered specimens are repeatedly brought to failure and discrete numerical fractures are filled with cohesive vein material after each fracture event. The specific vein-distribution measurements at Nkana serve as a powerful tool to critically assess this numerical modelling of distributed fracturing in an anisotropic layered rock.